Thesis #1

AN ACHIEVEMENT TEST IN MATHEMATICS
FOR GRADE SEVEN NEW BEDFORD
AS RELATED TO COURSE OF STUDY

Mary A. Keneally 1948

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Thesis

AN ACHIEVEMENT TEST IN MATHEMATICS FOR GRADE SEVEN NEW BEDFORD AS RELATED TO COURSE OF STUDY

Submitted by:

Mary Agnes Keneally

(B.S. in Ed. Boston University 1944)

In partial fulfillment of Requirements for the

Degree of Master of Education

1948

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3. W. Linwood Chase, Professor of Education

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I

STATEMENT OF THE PROBLEM

The purpose of this study was to build an instrument that would measure achievement of the pupils in seventh grade mathematics for the New Bedford Course of Study. It was hoped that such an instrument when item analyzed and refined, would be valuable in pointing to the strengths and weaknesses in the present plan, and help in planning for future classes.

In view of the fact that this is an achievement test to be used as a diagnostic measure it should:

1. Identify the number of pupils who have actually achieved growth in seventh grade mathematical understandings.

2. Bring into prominence the work that has been well mastered or inadequately mastered.

3. Aid in the proper selection and organization of material for remedial work.

Such a test administered at the completion of a year's work can be, and is of great value to any teacher who will make use of her findings for the benefit of her future classes in mathematics. It would provide a teacher with a means of locating weak spots in the learning situations of the various topics required in the seventh grade mathematics course in New Bedford. This information once secured would indicate to a teacher where

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to put the emphasis in teaching seventh grade mathematics, for she would then be in a position to guide pupils in an intelligent study and solution of their mathematical difficulties.

Test construction technique employed, involved the construction of items, the administration of the test to two hundred fifty pupils, and a study of differentiating value and difficulty of each item prior to its selection in the test.

BACKGROUND OF RESEARCH

The value of such mathematics tests have been recognized and approved in the Educational Bulletin # 9[1], published by the California Test Bureau, for it states that:

> "Although lack of adequate mental maturity is sometimes a limiting factor, usually the most significant obstacle to progress is failure on the part of the teacher to identify the unmastered elements and to assist pupils in making lists of their specific needs as a guide to intelligent study. When both teachers and pupils know exactly what is to be done, all of the varied resources of methods and proceedures may be focused on these pupil needs."

Obviously, the progressive mathematics teacher will make a genuine effort to locate the causes of pupil failure in her classes by administering both diagnostic and achievement tests during the course of the school year, and then use the information that the results disclose, to aid her students in mastering the weaknesses they are shown to possess.

[1] Educational Bulletin No. 9, "Identifying Difficulties in Learning Arithmetic", California Test Bureau, 5916 Hollywood Boulevard, Los Angeles 28, California, 1945, p. 2

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The fact that, according to this same Bulletin[1], "The variability in understanding and skill in mathematics increases continuously as pupils proceed through the elementary and secondary school grades: i.e. the gap between the poorest and best pupils increases", is cause enough for the junior high teacher to at least make an attempt to eliminate some of the confusion that must be present in the minds of the low achievers. This valuable step toward improved arithmetic understandings is best attempted by testing each individual pupil to learn his strengths and weaknesses. Only when the teacher has this vital information can she do her part to narrow the existing gap between the two groups of learners.

Brueckner and Grossnickle[2] in their discussion of achievement tests state that knowledge of the characteristic differences between good and poor achievers in arithmetic, obtained by the administering of such tests is valuable to the teacher as a basis of guidance and diagnosis.

In another recent study by Micheels and Karns[3] on this same subject, the authors declare that, "The informal written achievement examination remains one of the most important of the several devices used to measure student progress."

[1]Ibid., p. 7

[2]Brueckner, Leo J. and Foster E. Grossnickle, "How to Make Arithmetic Meaningful", John C. Winston Company, Philadelphia, 1947, p. 417

[3]Micheels, W.J. and M. Ray Karns, "Construction of Written Achievement Tests", Ind. Arts and Vocational Education, 32: 269-74, 307-12, s-O, 1943

The first step, according to the same Williams, "involves the establishment and utilization of instructional objectives in cognitive, affective and psychomotor domains as goals pursued through the elementary and secondary school years i.e. the gap between the possible and best possible achievement", is taken when the teacher sets up objectives to at least make an attempt to eliminate some of the confusion that must be present in the minds of the low achievers. This validity also tends improve arithmetic achievement when is best attempted by testing each individual pupil to learn his arithmetic and weaknesses. Only when the teacher has this vital information can she be in a position to narrow the existing gap between the two groups of learners.

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Goetting[1] believes testing to be one of the important phases of a teacher's work, whether it is to measure the progress of students, the efficiency of teaching, or the general success of the school. An achievement test, he says, may be used to determine promotion of pupils, to determine whether pupils have met the minimum standards, or to decide whether the content of a subject has been mastered.

Every person in the teaching field will attest to the importance of testing pupils on subject matter taught, for the primary purposes that Goetting mentions.

Thus we find outstanding educators who are in agreement as to the usefulness and real needs of administering some form of informal diagnostic or achievement examination to pupils in order to locate their specific strengths and weaknesses. If they are properly constructed, these tests can be of inestimable value, for their chief service lies in their power to determine the points at which instructional adjustments must be made.

Hawkes, Lindquist, and Mann[2] state that if general achievement tests are to be of any functional value, each of the items must be missed by some pupils but not by all. However, in diagnostic tests they feel it is legitimate to include any items about which information concerning the achieve-

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ment of pupils is desired. As a result they say that some of the most important items of achievement are of least functional value in a general achievement test.

The above statements are applicable to the test constructed by the writer, for this instrument was given to test the achievement of pupils, but was also used as a diagnostic measure. Several items in the test proved to have no functional value as they were definite information desired on needed skills acquired.

Tiegs[1], an outstanding authority on testing, has little use for teacher-made tests which he states only serve to confuse teachers as well as pupils. Few teachers he thinks, have adequate appreciation of the essential specific objectives to be attained, and on which the development of test items is dependent. He believes that it is much better to give one or two properly validated diagnostic tests during a semester than a host of poor teacher-made tests. The development of valid diagnostic tests require the best efforts of specialists, and according to Tiegs, we should leave that work to them.

One cannot but agree with Tiegs as to the uselessness of presenting poorly constructed tests to pupils, but it is difficult to believe that the well-planned informal test construced by an experienced instructor in mathematics, and adapted to the local Course of Study, would not be a useful instrument to

[1]Tiegs, Ernest W., Educational Bulletin # 18,"Educational Diagnosis", California Test Bureau, 5916 Hollywood Boulevard, Los Angeles 28, California, 1948, p. 8

her in supplying worthwhile information by revealing pupil strength and weakness in the field of subject matter she wishes to test.

Wilson, Stone, and Dalrymple[1] on the contrary, apparently do not consider that only standardized tests should be given to determine the achievement of pupils, for they assert that tests cannot be helpful unless they are properly constructed. Seventh grade percentage and interest they designate as drill and state that they should have checking for mastery. However, they propose that any competent teacher can do this testing without using a standardized test. They conclude that, "The fact that they are standardized through statistical treatment does not improve their quality. If the basic elements of a test are wrong to start on, they are still wrong after being given the standardizing treatment."

Most experienced mathematics teachers will agree with this line of thought, for they are cognizant of the fact that a standard test suitable for use in every section of the U.S. would be an impossibility, as environments vary. Courses of study must be flexible and adapted to meet the needs of each particular community. It often, therefore, is much more meaningful and valuable for teachers to construct informal tests that will measure more accurately than a standardized test, what they specifically desire to measure.

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In opposition to Tieg's belief, Greene, Jorgensen, and Gerberich[1] also maintain that,

"Although properly constructed standardized educational tests are superior in certain respects to teacher-made examinations, they will probably never entirely displace them as a means of measuring the results of teaching as indicated by pupil attainment. The teacher frequently has need for a measuring instrument adapted to a particular course of study, or to the emphasis which has been given to the subject in the teaching of a particular class. The informal objective examination constructed by the teacher to fit the instruction which the class has been receiving is the obvious answer."

The conclusions that one gathers from the foregoing statements, with the exception of Tieg's, are that informal diagnostic or achievement tests can be very useful instruments if prepared intelligently and administered for the definite purpose of locating, and then aiding in the elimination of weak spots in the pupils' learning situations.

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II

PLAN OF STUDY

In constructing this mathematics test for Grade Seven, the New Bedford Course of Study was consulted and the minimum requirements followed, so that all required topics would be included. The contents of the test were chosen to meet the following objectives that seventh grade teachers in this city would bear in mind when teaching the required course of study.

1. To provide pupils with an understanding of the following vocabulary used in relation to seventh grade mathematics.

sum	per cent	denominate number
difference	equivalents	estimate
minuend	decimal	annex
subtrahend	marked price	average
remainder	discount	numerator
multiplicand	rate of discount	denominator
multiplier	selling price	approximate
product	amount of sales	reduction
dividend	commission	factor
divisor	net proceeds	cancellation
quotient	profit	successive
digits	loss	trade discount
graph	meter	list price

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prime	meter	list price

net price	semi-circle	equilateral triangle
principal	arc	right angle
rate of interest	formula	isosceles triangle
scale	radius	cubic inch
horizontal	diameter	parallelogram
vertical	circumference	trapezoid
perpendicular	capacity	rectangular solid
intersecting	degree	pair of compasses
parallel	base	obtuse
protractor	height	acute
square inch	dimensions	volume
angle	unit	height) same
		altitude)meaning

2. To develop an understanding of meaning of words "per cent of".

3. Ability to express per cents (correctly and with understanding) in their decimal and fractional form.

4. To provide skill in finding per cents of numbers.

5. To obtain skill in writing U.S. money correct to the nearest cent.

6. To test student's ability to use the following short cuts in their per cent work.

25% = $\frac{1}{4}$	20% = 1/5	$12\frac{1}{2}$% = 1/8	33 1/3% = 1/3
50% = $\frac{1}{2}$	40% = 2/5	$37\frac{1}{2}$% = 3/8	66 2/3% = 2/3
75% = $\frac{3}{4}$	60% = 3/5	$62\frac{1}{2}$% = 5/8	16 2/3% = 1/6
100% = 1	80% = 4/5	$87\frac{1}{2}$% = 7/8	83 1/3% = 5/6
10% =1/10	30% = 3/10	8 1/3% =1/12	6 1/4% = 1/16

net price	semi-circle	equilateral triangle
principal	arc	right angle
rate of interest	formula	isosceles triangle
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2. To develop an understanding of meaning of words "per cent of".

3. Ability to express per cents (correctly and with understanding) in their decimal and fractional form.

4. To provide skill in finding per cents of numbers.

5. To obtain skill in writing U.S. money correct to the nearest cent.

6. To test student's ability to use the following short cuts in their per cent work.

25% = ¼	20% = 1/5	12½% = 1/8	33 1/3% = 1/3
50% = ½	40% = 2/5	37½% = 3/8	66 2/3% = 2/3
75% = ¾	60% = 3/5	62½% = 5/8	16 2/3% = 1/6
100% = 1	80% = 4/5	87½% = 7/8	83 1/3% = 5/6
10% = 1/10	30% = 3/10	8 1/3% = 1/12	6 1/4% = 1/16

7. To aid pupils to memorize the above fractional equivalents of common per cents.

8. Ability to find what per cent one number is of another.

9. To recognize the difference between first and second case percentage.

10. To apply use of percentage in problem solving when teaching commission, discounts and profit and loss.

11. Ability to work problems involving second case percentage.

12. To gain skill in performing second case per cent examples by learning function of word "of" in each problem.

13. To gain skill in the use of successive discounts.

14. To enable pupils to obtain net price by either of two methods that have been taught.

15. To teach well the meaning of i = p r t

16. To aid pupils to interpret and use with understanding the mensuration formulas of this grade.

17. To clarify the meaning of words "perimeter" and "area".

18. To provide problems illustrating common need for finding perimeter and area.

19. To know what a parallelogram is and how to find its area..

20. To teach students the methods of reducing common measurements to higher or lower form.

21. To teach pupils how to use a protractor.

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17. To clarify the meaning of words "perimeter" and "area".

18. To provide problem illustrating common need for finding perimeter and area.

19. To know what a parallelogram is and how to find its area.

20. To teach simple the methods of reducing common measurements to higher or lower form.

21. To teach pupils how to use a protractor.

22. To enable students to distinguish the three kinds of common triangles from one another. (right triangle, isosceles triangle, and equilateral triangle.)

23. To find the area of triangles.

24. To learn the difference in form of the acute, obtuse, and right angle.

25. To enable pupils to find the circumference and area of circles with understanding.

26. To help pupils to use cubic measure intelligently.

27. Provide problems with life situations to supplement the various forms of measurement presented, so as to aid pupils in the mastery of the subject.

28. To obtain some skill in the interpretation of simple line, bar, and circle graphs.

29. To enable students to comprehend the reading of gas and electric meters and to understand the figuring of the rates.

22. To enable students to distinguish the three kinds of common triangles from one another. (right triangle, isosceles triangle, and equilateral triangle.)

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29. To enable students to comprehend the reading of gas and electric meters and to understand the figuring of the rates.

Outline of Test

TEST I PERCENTAGE

a. Changing per cents to decimal and fractional equivalents and vice versa.

b. Finding per cents of numbers

1. by decimal method

2. by fractional equivalents

c. Finding what % one number is of another

1. per cent of increase or decrease

d. Finding interest

1. for years, for days

2. exact interest

3. rate of interest

TEST II PROBLEMS IN PERCENTAGE (12 problems)

a. finding % of a number (2)

b. net price (single discount)

c. commission

d. % of decrease

e. profit

f. net price (successive discount)

g. rate of interest

h. net proceeds

i. rate of discount

j. finding rate per cent (2)

Outline of Test

TEST I PERCENTAGE

a. Changing per cents to decimal and fractional equivalents and vice versa.

b. Finding per cents or numbers

1. by decimal method

2. by fractional equivalents

c. Finding what % one number is of another

1. per cent of increase or decrease

d. Finding interest

1. for years, for days

2. exact interest

3. rate of interest

TEST II PROBLEMS IN PERCENTAGE (18 problems)

a. Finding % of a number (2)

b. net price (single discount)

c. commission

d. % of decrease

e. profit

f. net price (successive discount)

g. rate of interest

h. net proceeds

i. rate of discount

j. finding rate per cent (2)

TEST III <u>GENERAL INFORMATION</u> ---Measurement, Vocabulary, Formulas, Graphs

A.

1. finding perimeter
2. finding area of rectangle
3. finding circumference
4. circle graph
5. changing from lower to higher denomination
6. scale interpretation
7. testing vocabulary and formulas

B. True and False Test

(testing vocabulary, formulas)

C. Matching Test

(testing vocabulary, formulas)

D. Interpretation of a Line Graph

TEST IV <u>PROBLEMS IN MEASUREMENT</u> (12 problems)

a. area of rectangle

b. changing from lower to higher denomination (4)

c. volume

d. area of triangle

e. circumference

f. kilowatt hours

g. perimeter

h. area of circle

i. parallelogram

TEST III <u>GENERAL INFORMATION</u> ---Measurement, Vocabulary, Formulas, Graphs

A.

1. finding perimeter
2. finding area of rectangle
3. finding circumference
4. circle graph
5. changing from lower to higher denomination
6. scale interpretation
7. testing vocabulary and formulas

B. Time and Rules Test

(testing vocabulary, formulas)

C. Matching Test

(testing vocabulary, formulas)

D. Interpretation of a line Graph

TEST IV <u>PROBLEMS IN MEASUREMENT</u> (12 problems)

a. area of rectangle
b. changing from lower to higher denomination (2)
c. volume
d. area of triangle
e. circumference
f. kilowatt hours
g. perimeter
h. area of circle
i. parallelogram

This preliminary test consisted of one hundred forty-nine items and was divided into four sections as shown by the outline. It was administered at the close of the school year to two hundred fifty pupils, homogeneously classified in ten classes at the Roosevelt Junior High School. Two seventh grade mathematics teachers each gave the test to five classes during four class periods of fifty minutes each.

Of the seventy-six words listed in the seventh grade mathematics vocabulary, eleven were review words of previous grades, and were not considered in the construction of the test. Fifty-eight of the remaining words were used one or more times to formulate the problems of the test. Only seven of the listed words were not included, but others commonly used in the work of this grade and not found in the vocabulary list were substituted. The word "trapezoid" was omitted because it was not listed under the minimum requirements of the Course of Study.

Omitted words	Added words
trade discount	nearest cent
unit	increase
rectangular solid	decrease
trapezoid	interest
amount of sales	regular price
equilateral triangle	perimeter
semi-circle	area
	square foot

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Omitted words	Added words
trade discount	nearest cent
unit	increase
rectangular solid	decrease
trapezoid	interest
amount of sales	regular price
equilateral triangle	perimeter
semi-circle	area
	square foot

Van Engen[1] writes that the child's ability to interpret problems is very dependent upon his understanding of the mathematics vocabulary employed. Duncan[2] also feels just as strongly that, "Appreciation of situations and meanings of words are essential to a meaningful solution of problems dealing with any application of percentage."

Therefore, in full agreement with these views, the problems used in Test II and Test IV were constructed by the writer so that both the required vocabulary and the skills in performing the solution of a problem would be utilized. Thirteen words listed in the seventh grade vocabulary were given a dominant place in the twelve problems which the pupils were asked to solve in Test II. In Test IV, eight more of these words were included in the wording of the problems.

In Test I, which consisted of sixty-five items, there were seven separate divisions, and therefore, seven individual marks were allowed and the average for the test as a whole, was then figured. Test III had sixty items and was divided into four sections, and this was scored in the same manner as was used for Test I. Tests II and IV consisted of twelve problems each, and but one score was obtainable on either set.

[1]Van Engen, Lela G., "Measuring Arithmetical Achievement", condensation of the author's thesis submitted for the Master's Degree at University of Iowa in July, 1942. Mathematics Teacher, Vol. 37, 1944, pp. 217-218

[2]Duncan, Myrtle, "Meaningful Symbols in Mathematics" as a Better Preparation for Jr. and Sr. High School Mathematics," Mathematics Teacher, Vol. 32, 1932, No. 4, p. 118

Van Engen[1] writes that the child's ability to interpret problems is very dependent upon his understanding of the mathematics vocabulary employed. Duncan[2] also feels just as strongly that, "Appreciation of situations and meanings of words are essential to a meaningful solution of problems dealing with any application of percentage."

Therefore, in full agreement with these views, the problems used in Test II and Test IV were constructed by the writer so that both the required vocabulary and the skills in performing the solution of a problem would be utilized. Thirteen words listed in the seventh grade vocabulary were given a dominant place in the twelve problems which the pupils were asked to solve in Test II. In Test IV, eight more of these words were included in the wording of the problems.

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I. Q. scores were recorded for all pupils in the tested group. From the two hundred fifty scores obtained, the fifty papers showing the highest achievement, and the fifty papers showing lowest achievement were selected for the purpose of comparing the achievement of these two groups.

By use of the Edgerton[1] Tables, an item analysis of each of the one hundred forty-nine items was undertaken. F. C. Mills[2] states that "a reasonable criterion for a true difference would be a difference that would occur by chance once in a hundred times or less frequently. The difference in units of the standard error corresponding to a probability of one one-hundredth is 2.576." Therefore, this Critical Ratio of 2.576 was used as a level of significance for items showing a true difference between the students who understood and did items correctly and the students who did poorly.

[1]Edgerton's Tables ("Table of Standard Error and Probable Errors of Percentages for Varying Numbers of Cases") , Journal of Applied Psychology, 10: 378-391, September, 1926

[2]Mills, Frederick C., "Statistical Methods", Henry Holt & Co. New York, 1938, p. 471

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[1] Ebbertson's Tables ("Table of Standard Error and Probable Errors of Percentages for Varying Numbers of Cases") , Journal of Applied Psychology, 13: 378-391, September, 1929

[2] Mills, Frederick C., "Statistical Methods", Henry Holt & Co. New York, 1934, p. 491

III

ANALYSIS OF DATA

Item Analysis. A critical ratio of each individual item in this mathematics test was figured by comparing the number right in the upper fifty cases and the lower fifty cases. Table I shows the critical ratio of each of these one hundred forty-nine items.

In Test I on percentage, twenty-two of the sixty-five items have no testing significance. Many of these, especially in Parts 1, 2, and 3, had no functional value because they were not missed by any pupil in the upper group. This was perhaps due to the fact that certain things had been learned or certain skills had been acquired by all the pupils in the group, but were included because in a diagnostic test of this type, it is information that the teacher requires. In Part 3, item 10 in this test was poorly placed on the page and, therefore, omitted by many students The critical ratio was obtained by calling it incorrect if not attempted, and as a result it does not reveal a true difference.

Twelve problems in percentage were given in Test II and eleven of these proved to be statistically significant and, therefore, valid test items.

Test III, a General Information Test on measurements, vocabulary, formulas, and graphs, was divided into four sections.

III

ANALYSIS OF DATA

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Twelve problems in percentage were given in Test II and eleven of these proved to be statistically significant and, therefore, valid test items.

Test III, a General Information Test on measurements, vocabulary, formulas, and areas, was divided into four sections.

Section I revealed nine articles of the fourteen given, as significant. Section II had twenty-four true and false items and only fifteen of these provided a worthwhile difference. Item fourteen in this group showed that the lower group achieved better scores than did the upper group, and so should be discarded as a poor item. Section III, a matching test, had twelve items and ten of these proved to be statistically significant. The fourth section required the reading of a line graph, and eight of the ten questions showed a very satisfactory degree of difference between the abilities of the two groups compared.

Test IV was composed of twelve problems in mensuration and every problem revealed a true difference in achievement between the good and poor students.

The distribution of total scores obtained on the Achievement Test in Mathematics by these two groups, is presented in relationship to I. Q. scores in Table II.

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Test IV was composed of twelve problems in mensuration and every problem revealed a true difference in achievement between the good and poor students.

The distribution of total scores obtained on the Achievement Test in Mathematics by these two groups, is presented in relationship to I. C. scores in Table II.

TABLE I

ITEM ANALYSIS

Test I--Percentage

Part I

Ex.	Upper	Lower	$S E^2$ Upper	$S E^2$ Lower	Diff.	S E Diff. p_1 p_2	Critical Ratio
1.	100%	94%	.000120	.001156	6%	3.5	1.71
2.	100%	88%	.000120	.002116	12%	4.7	2.55
3.	100%	94%	.000120	.001156	6%	3.5	1.71
4.	100%	90%	.000120	.001764	10%	4.3	2.32
5.	100%	86%	.000120	.002401	14%	5.0	2.80 *
6.	98%	68%	.000400	.004356	30%	6.8	4.41 *
7.	94%	80%	.001156	.003219	14%	6.6	2.12
8.	98%	82%	.000400	.002916	16%	5.7	2.80 *
9.	92%	62%	.001444	.004761	30%	7.8	3.84 *
10.	100%	84%	.000120	.002704	16%	5.3	3.01 *

Part II

1.	100%	96%	.000120	.000784	4%	3.0	1.33
2.	98%	88%	.000400	.002116	10%	5.0	2.00
3.	92%	66%	.001444	.004489	26%	7.7	3.37 *
4.	94%	66%	.001156	.004489	28%	7.5	3.73 *
5.	96%	76%	.000784	.003600	20%	6.6	3.03 *

TABLE I

ITEM ANALYSIS

Test I--Percentage

Ex.	Part I Upper	Lower	Upper	Lower	Diff.	S E Diff.	Critical Ratio T_1 P_c
1.	100%	94%	.000120	.001156	6%	3.8	1.71
2.	100%	88%	.000120	.002116	12%	4.7	2.55
3.	100%	94%	.000120	.001156	6%	3.8	1.71
4.	100%	90%	.000120	.001764	10%	4.3	2.32
5.	100%	86%	.000120	.002401	14%	5.0	2.80 *
6.	92%	68%	.000400	.004356	30%	6.6	4.41 *
7.	84%	80%	.001156	.003136	14%	6.6	2.12
8.	98%	82%	.000400	.002916	16%	5.7	2.80 *
9.	92%	68%	.001444	.004761	30%	7.8	3.84 *
10.	100%	84%	.000120	.002704	15%	5.5	3.01 *

Part II

1.	100%	96%	.000120	.000784	4%	3.0	1.33
2.	98%	82%	.000400	.002116	16%	5.0	3.00
3.	92%	66%	.001444	.004489	26%	7.7	3.37 *
4.	84%	66%	.001156	.004489	28%	7.8	3.73 *
5.	96%	76%	.000784	.003600	20%	6.6	3.03 *

TABLE I--continued

ITEM ANALYSIS

Ex.	Upper	Lower	$S\ E^2$ Upper	Lower	Diff.	S E Diff.	p_1 p_2	C R
Part III								
1.	98%	84%	.000400	.002704	14%	5.5		2.54
2.	100%	92%	.000120	.001444	8%	3.9		2.05
3.	100%	84%	.000120	.002704	16%	5.3		* 3.01
4.	100%	100%	.000120	.000120	0%	0		0.
5.	100%	92%	.000120	.001444	8%	3.9		2.05
6.	98%	96%	.000400	.000784	2%	3.4		.588
7.	100%	96%	.000120	.000784	4%	3.0		1.33
8.	98%	90%	.000400	.001764	8%	4.6		1.73
9.	100%	76%	.000120	.003600	24%	6.1		* 3.93
10.	86%	48%	.002401	.005041	38%	8.6		* 4.41
Part IV								
1.	100%	96%	.000120	.000784	4%	3.0		1.33
2.	100%	96%	.000120	.000784	4%	3.0		1.33
3.	78%	38%	.003481	.004761	40%	9.0		* 4.44
4.	98%	82%	.000400	.002916	16%	5.7		* 2.80
5.	94%	64%	.001156	.004624	30%	7.6		* 3.94
6.	88%	52%	.002116	.005041	36%	8.4		* 4.28
7.	100%	66%	.000120	.004489	34%	6.7		* 5.07
8.	94%	72%	.001156	.003969	22%	7.1		* 3.09
9.	100%	96%	.000120	.000784	4%	3.0		1.33
10.	100%	88%	.000120	.002116	12%	4.7		2.55

TABLE I--continued

ITEM ANALYSIS

	Upper	Lower	Upper	Lower	Diff.	% Diff.	C_1	C_2	D R
Part III									
1.	98%	94%	.000400	.002704	14%	6.8			2.94
2.	100%	92%	.000120	.001444	8%	3.9			2.05
3.	100%	84%	.000120	.002704	16%	5.3			* 3.01
4.	100%	100%	.000120	.000120	0%	0			0.
5.	100%	92%	.000120	.001444	8%	4.8			2.05
6.	98%	98%	.000400	.000784	2%	3.4			.849
7.	100%	98%	.000120	.000784	4%	3.0			1.33
8.	98%	90%	.000400	.001764	8%	4.5			1.78
9.	100%	72%	.000120	.003600	24%	6.1			* 3.93
10.	90%	48%	.002401	.008041	36%	3.8			* 4.41
Part IV									
1.	100%	96%	.000120	.000784	4%	3.0			1.33
2.	100%	96%	.000120	.000784	4%	3.0			1.33
3.	78%	38%	.003481	.014761	40%	9.0			* 4.44
4.	98%	92%	.000400	.002916	16%	5.7			* 2.80
5.	94%	64%	.001156	.004624	30%	7.5			* 3.94
6.	88%	52%	.002116	.008041	36%	7.4			* 4.39
7.	100%	84%	.000120	.004489	16%	6.7			* 3.07
8.	94%	72%	.001156	.003969	22%	7.1			* 3.09
9.	100%	96%	.000120	.000784	4%	3.0			1.33
10.	100%	78%	.000120	.002116	12%	4.7			2.55

TABLE I--continued

ITEM ANALYSIS

Ex.	Upper	Lower	$S\ E^2$ Upper	Lower	Diff.	S E Diff. $p_1\ p_2$	C R
Part V							
1.	100%	80%	.000120	.003219	20%	5.8	3.44*
2.	100%	82%	.000120	.002916	18%	5.5	3.27*
3.	100%	78%	.000120	.003481	22%	6.0	3.66*
4.	100%	80%	.000120	.003219	20%	5.8	3.44*
5.	98%	66%	.000400	.004489	32%	6.9	4.63*
6.	98%	72%	.000400	.003969	26%	6.6	3.93*
7.	100%	74%	.000120	.003844	26%	6.3	4.11*
8.	94%	52%	.001156	.005041	42%	7.8	5.38*
9.	94%	62%	.001156	.004761	32%	7.7	4.15*
10.	100%	58%	.000120	.004900	42%	7.0	6.00*
Part VI							
1.	92%	88%	.001444	.002116	4%	5.9	.67
2.	94%	70%	.001156	.004225	24%	7.3	3.28*
3.	92%	74%	.001444	.003844	18%	7.2	2.50
4.	92%	72%	.001444	.003969	20%	7.3	2.74*
5.	92%	80%	.001444	.003219	12%	6.8	1.76
6.	100%	76%	.000120	.003600	24%	6.1	3.93*
7.	92%	62%	.001444	.004761	30%	7.8	3.84*
8.	96%	64%	.000784	.004624	32%	7.3	4.38*
9.	98%	74%	.000400	.003844	24%	6.5	3.69*
10.	100%	78%	.000120	.003481	22%	6.0	3.66*

TABLE 1--continued

ITEM ANALYSIS

Test V							
Ex.	Upper	Lower	Upper	Lower	Diff.	S	Diff. / S
1.	100%	80%	.000120	.003219	20%	6.3	3.04*
2.	100%	82%	.000120	.003915	18%	6.5	3.27*
3.	100%	78%	.000120	.003481	22%	6.0	3.05*
4.	100%	80%	.000120	.003212	20%	6.8	2.94*
5.	98%	6%	.000400	.003485	32%	5.2	4.65*
6.	98%	72%	.000400	.003969	26%	5.6	3.93*
7.	100%	74%	.000120	.003944	26%	6.1	4.11*
8.	94%	82%	.001156	.003041	4%	7.8	6.38*
9.	94%	62%	.001156	.004751	32%	7.7	4.15*
10.	100%	68%	.000120	.004300	42%	7.0	6.00*
Test VI							
1.	92%	88%	.001444	.002116	4%	6.5	.67
2.	94%	70%	.001156	.004253	24%	7.5	3.22*
3.	92%	74%	.001444	.003944	18%	7.2	2.50
4.	92%	72%	.001444	.003969	20%	7.3	2.74*
5.	92%	80%	.001444	.003213	12%	6.9	1.70
6.	100%	7%	.000120	.003300	64%	6.1	3.92*
7.	92%	62%	.001444	.004751	30%	7.3	3.24*
8.	92%	64%	.000784	.004624	28%	7.3	3.28*
9.	98%	74%	.000400	.003944	24%	6.8	3.51*
10.	100%	78%	.000120	.003481	22%	6.0	3.60*

TABLE I--continued

ITEM ANALYSIS

Part VII

Ex.	Upper	Lower	$S E^2$ Upper	$S E^2$ Lower	Diff.	S E Diff. $p_1 p_2$	C R
1.	98%	90%	.000400	.001764	8%	4.6	1.74
2.	98%	80%	.000400	.003219	18%	6.0	3.0*
3.	86%	50%	.002401	.005041	36%	8.6	4.18*
4.	90%	62%	.001764	.004761	28%	8.0	3.50*
5.	98%	38%	.000400	.004761	60%	7.1	8.45*
6.	76%	26%	.003600	.003844	50%	8.6	5.81*
7.	88%	48%	.002116	.005041	40%	8.4	4.76*
8.	90%	62%	.001764	.004761	28%	8.0	3.50*
9.	66%	24%	.004489	.003600	42%	8.9	4.72*
10.	82%	4%	.002916	.000784	78%	6.7	11.64*

TABLE I--continued

ITEM ANALYSIS

Part VII							
			S E				
Ex.	Upper	Lower	Upper	Lower	Diff.	S E Diff.	C R p_1 p_2
1.	98%	50%	.000400	.001764	8%	4.6	1.74
2.	98%	40%	.000400	.002419	18%	6.0	3.0*
3.	94%	60%	.002401	.003041	36%	8.5	4.18*
4.	90	52%	.001764	.004761	28%	8.0	3.50*
5.	98%	38%	.000400	.004761	60%	7.1	8.46*
6.	70%	28%	.003600	.003844	50%	7.5	6.81*
7.	84%	12%	.002116	.003041	40%	7.4	4.76*
8.	90%	62%	.001764	.004761	28%	8.0	3.50*
9.	66%	24%	.004489	.003600	4%	8.0	4.72*
10.	92%	4%	.002116	.000784	78%	6.7	11.64*

TABLE I

ITEM ANALYSIS

Test II--Percentage Problems

			$S\ E^2$				
Ex.	Upper	Lower	Upper	Lower	Diff.	S E Diff. $p_1\ p_2$	C R
1.	100%	78%	.000120	.003481	22%	6.0	3.66*
2.	100%	72%	.000120	.003969	28%	6.3	4.44*
3.	100%	56%	.000120	.004900	44%	7.0	6.28*
4.	92%	24%	.001444	.003600	68%	7.1	9.57*
5.	96%	44%	.000784	.004900	52%	7.5	6.93*
6.	96%	82%	.000784	.002916	14%	6.0	2.33
7.	98%	44%	.000400	.004900	54%	7.2	7.50*
8.	92%	68%	.001444	.004356	24%	7.6	3.15*
9.	88%	48%	.002116	.005041	40%	8.4	4.76*
10.	100%	22%	.000120	.003481	78%	6.0	13.00*
11.	96%	48%	.000784	.005041	48%	7.6	6.31*
12.	96%	20%	.000784	.003219	76%	6.3	12.06*

TABLE I

ITEM ANALYSIS

Test II--Percentage Problems

Ex.	Upper	Lower	Upper	Lower	Diff.	C R	P_1 P_2	C R
1.	100%	78%	.000120	.003401	32%	6.0		3.56*
2.	100%	72%	.000120	.003969	28%	5.3		4.44*
3.	100%	56%	.000120	.004900	44%	7.0		5.28*
4.	92%	48%	.001444	.003600	68%	7.1		5.57*
5.	96%	44%	.000784	.004900	52%	7.5		6.95*
6.	96%	82%	.000784	.003969	14%	6.2		2.33
7.	96%	44%	.000400	.004900	52%	7.2		7.50*
8.	92%	68%	.001444	.004356	24%	7.6		3.16*
9.	88%	48%	.002116	.006041	40%	5.4		4.76*
10.	100%	32%	.000120	.003481	78%	6.0		12.00*
11.	96%	48%	.000784	.003041	48%	7.6		6.31*
12.	96%	20%	.000784	.003249	76%	6.3		12.06*

TABLE I

ITEM ANALYSIS

Test III--General Information

Ex.	Upper	Lower	$S E^2$ Upper	Lower	Diff.	S E Diff. $p_1 p_2$	C R
Part I							
1.	46%	8%	.004900	.001444	38%	7.9	4.81*
2.	82%	74%	.002916	.003844	8%	8.2	.97
3.	92%	52%	.001444	.005041	40%	8.0	5.00*
4.	88%	40%	.002116	.004761	48%	8.2	5.85*
5.	100%	80%	.000120	.003219	20%	5.7	3.50*
6.	100%	88%	.000120	.002116	12%	4.7	2.55
7.	100%	92%	.000120	.001444	8%	3.9	2.05
8.	96%	46%	.000784	.004900	50%	7.5	6.66*
9.	100%	80%	.000120	.003219	20%	5.8	3.44*
10.	98%	56%	.000400	.004900	42%	7.2	5.83*
11.	100%	96%	.000120	.000784	4%	3.0	1.33
12.	70%	58%	.004225	.004900	12%	9.5	1.26
13.	94%	48%	.001156	.005041	46%	7.8	5.89*
14.	38%	12%	.004761	.002116	26%	8.2	3.17*
Part II							
1.	100%	84%	.000120	.002704	16%	5.3	3.01*
2.	78%	70%	.003481	.004225	8%	8.8	.91
3.	90%	70%	.001764	.004225	20%	7.7	2.60*
4.	100%	84%	.000120	.002704	16%	5.3	3.01*
5.	96%	80%	.000784	.003219	16%	6.3	2.54

TABLE I

ITEM ANALYSIS

Test III--General Information

Ex.	Upper	Lower	$S\ E^2$ Upper	Lower	Diff.	S E Diff.	$P_1\ P_2$	C R
1.	46%	8%	.004900	.001444	38%	7.9		4.81*
2.	82%	74%	.002916	.003844	8%	8.2		.97
3.	92%	52%	.001444	.005041	40%	8.0		5.00*
4.	88%	40%	.002116	.004761	48%	8.2		5.85*
5.	100%	80%	.000120	.003219	20%	5.7		3.50*
6.	100%	88%	.000120	.002116	12%	4.7		2.55
7.	100%	92%	.000120	.001444	8%	3.9		2.05
8.	96%	46%	.000784	.004900	50%	7.5		6.66*
9.	100%	80%	.000120	.003219	20%	5.8		3.44*
10.	98%	56%	.000400	.004900	42%	7.2		5.83*
11.	100%	96%	.000120	.000784	4%	3.0		1.33
12.	70%	58%	.004225	.004900	12%	9.5		1.26
13.	94%	48%	.001156	.005041	45%	7.8		5.89*
14.	38%	12%	.004761	.002116	26%	8.2		3.17*
Part II								
1.	100%	84%	.000120	.002704	16%	5.3		3.01*
2.	78%	70%	.005481	.004225	8%	8.8		.91
3.	90%	70%	.001764	.004225	20%	7.7		2.60*
4.	100%	84%	.000120	.002704	16%	5.3		3.01*
5.	98%	80%	.000784	.003219	16%	5.3		2.54

TABLE I

ITEM ANALYSIS

Test III--General Information

Part II (continued)

Ex.	Upper	Lower	$S E^2$ Upper	Lower	Diff.	S E Diff. $p_1 p_2$	C R
6.	82%	60%	.002916	.004761	22%	8.7	2.52
7.	70%	36%	.004225	.004624	34%	9.4	3.61*
8.	82%	56%	.002916	.004900	26%	8.8	2.95*
9.	100%	76%	.000120	.003600	24%	6.1	3.93*
10.	96%	76%	.000784	.003600	20%	6.6	3.03*
11.	100%	66%	.000120	.004489	34%	6.7	5.07*
12.	98%	66%	.000400	.004489	32%	6.9	4.63*
13.	84%	62%	.002704	.004761	22%	8.6	2.55
14.	64%	84%	.004624	.002704	20%	8.5	2.35
15.	96%	80%	.000784	.003219	16%	6.3	2.54
16.	100%	50%	.000120	.005041	50%	7.1	7.04*
17.	96%	80%	.000784	.003219	16%	6.3	2.54
18.	100%	88%	.000120	.002116	12%	4.7	2.55
19.	70%	42%	.004225	.004900	28%	9.5	2.94*
20.	76%	52%	.003600	.005041	24%	9.3	2.58*
21.	98%	78%	.000400	.003481	20%	6.2	3.22*
22.	88%	70%	.002116	.004225	18%	7.9	2.27
23.	94%	62%	.001156	.004761	32%	7.6	4.21*
24.	100%	86%	.000120	.002401	14%	5.0	2.80*

TABLE I

ITEM ANALYSIS

Test III--General Information

| Item II (continued) | | |

TABLE I

ITEM ANALYSIS

Test III--General Information

Part III			S E^2				
Ex.	Upper	Lower	Upper	Lower	Diff.	S E Diff. p_1 p_2	C R
1.	92%	70%	.001444	.004225	22%	7.5	2.93*
2.	80%	52%	.003219	.005041	28%	9.0	3.11*
3.	96%	38%	.000784	.004900	58%	7.5	7.73*
4.	70%	66%	.004225	.004489	4%	9.3	.43
5.	100%	78%	.000120	.003481	22%	6.0	3.66*
6.	98%	60%	.000400	.004761	38%	7.1	5.35*
7.	100%	72%	.000120	.003969	28%	6.3	4.44*
8.	92%	56%	.001444	.004900	36%	7.9	4.55*
9.	86%	62%	.002401	.004761	24%	8.4	2.85*
10.	100%	74%	.000120	.003844	26%	6.3	4.12*
11.	84%	56%	.002704	.004900	28%	8.7	3.21*
12.	98%	92%	.000400	.001444	6%	4.3	1.40
Part IV							
1.	98%	86%	.000400	.002401	12%	5.3	2.26
2.	100%	66%	.000120	.004489	34%	6.7	5.07*
3.	92%	62%	.001444	.004761	30%	7.8	3.84*
4.	92%	52%	.001444	.005041	40%	8.0	5.0 *
5.	90%	38%	.001764	.004761	52%	8.0	6.5 *

TABLE I

ITEM ANALYSIS

Test XII--General Information

Sx.	Upper	Lower	Upper	Lower	Diff.	% Diff.	σ_1	σ_2	σ_D
1.	92%	70%	.001444	.004225	22%	7.5			3.85*
2.	80%	58%	.003219	.003041	22%	9.0			3.11*
3.	96%	38%	.000784	.004900	58%	7.5			7.73*
4.	70%	65%	.004225	.004489	4%	4.3			.45
5.	100%	78%	.000120	.003481	22%	6.0			3.35*
6.	98%	60%	.000400	.004761	38%	7.1			5.35*
7.	100%	72%	.000120	.003969	28%	6.5			4.44*
8.	92%	88%	.001444	.004900	4%	7.9			4.55*
9.	86%	62%	.002401	.004761	24%	8.4			2.85*
10.	100%	74%	.000120	.003844	26%	6.2			4.12*
11.	94%	66%	.002704	.004900	28%	8.7			3.21*
12.	98%	92%	.000400	.001444	6%	4.4			1.40

Part IV

1.	98%	86%	.000400	.002401	12%	5.5			2.26
2.	100%	68%	.000120	.004489	44%	6.7			5.07*
3.	92%	68%	.001444	.004761	30%	7.8			3.46*
4.	92%	52%	.001444	.006041	40%	8.3			5.0*
5.	90%	38%	.001784	.004761	52%	8.0			6.5*

TABLE I

ITEM ANALYSIS

Test III--General Information

Part IV (continued)			$S E^2$				
Ex.	Upper	Lower	Upper	Lower	Diff.	S E Diff. p_1 p_2	C R
6.	78%	20%	.003481	.003219	58%	8.1	7.16*
7.	86%	34%	.002401	.004489	52%	8.3	6.26*
8.	64%	16%	.004624	.002704	48%	8.5	5.64*
9.	98%	80%	.000400	.003219	18%	6.0	3.0 *
10.	82%	68%	.002916	.004356	14%	8.5	1.64

TABLE I

ITEM ANALYSIS

Test III--General Information

Part IV (continued)

Tx.	Upper	Lower	Upper	Lower	Diff.	S E Diff.	$P_1 P_2$	C R
6.	78%	20%	.003401	.001219	58%	8.1		7.16*
7.	46%	34%	.002401	.001419	52%	8.5		6.20*
8.	94%	16%	.001234	.000704	48%	8.5		5.64*
9.	98%	30%	.000400	.001219	18%	8.0		2.0 *
10.	82%	68%	.002815	.001455	14%	8.5		1.64

TABLE I

ITEM ANALYSIS

Test IV--Measurement Problems

			S E^2				
Ex.	Upper	Lower	Upper	Lower	Diff.	S E Diff. p_1 p_2	C R
1.	100%	60%	.000120	.004761	40%	6.9	5.79*
2.	96%	62%	.000784	.004761	34%	7.4	4.6 *
3.	96%	24%	.000784	.003600	72%	6.6	10.90*
4.	90%	26%	.001764	.003844	64%	7.4	8.64*
5.	96%	46%	.000784	.004900	50%	7.5	6.66*
6.	98%	50%	.000400	.005041	48%	7.3	6.57*
7.	100%	50%	.000120	.005041	50%	7.1	7.04*
8.	90%	36%	.001764	.004624	54%	7.9	6.83*
9.	88%	2%	.002116	.000400	86%	5.0	17.2 *
10.	72%	8%	.003969	.001444	64%	7.3	8.76*
11.	86%	18%	.002401	.002916	68%	7.2	9.44*
12.	96%	42%	.000784	.004900	54%	7.5	7.20*

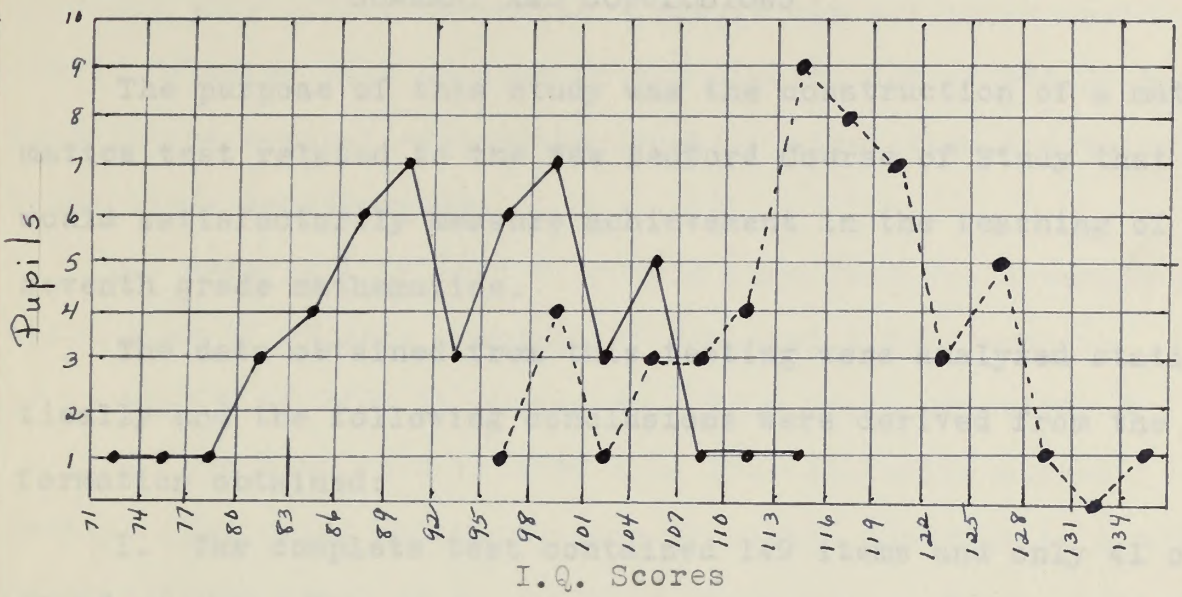
TABLE I

ITEM ANALYSIS

Test IV--Measurement Problems

TABLE II

Relationship of I.Q. to Test Scores



Lower 50 _____. Arithmetic Mean 93.72 S.D. 9.29

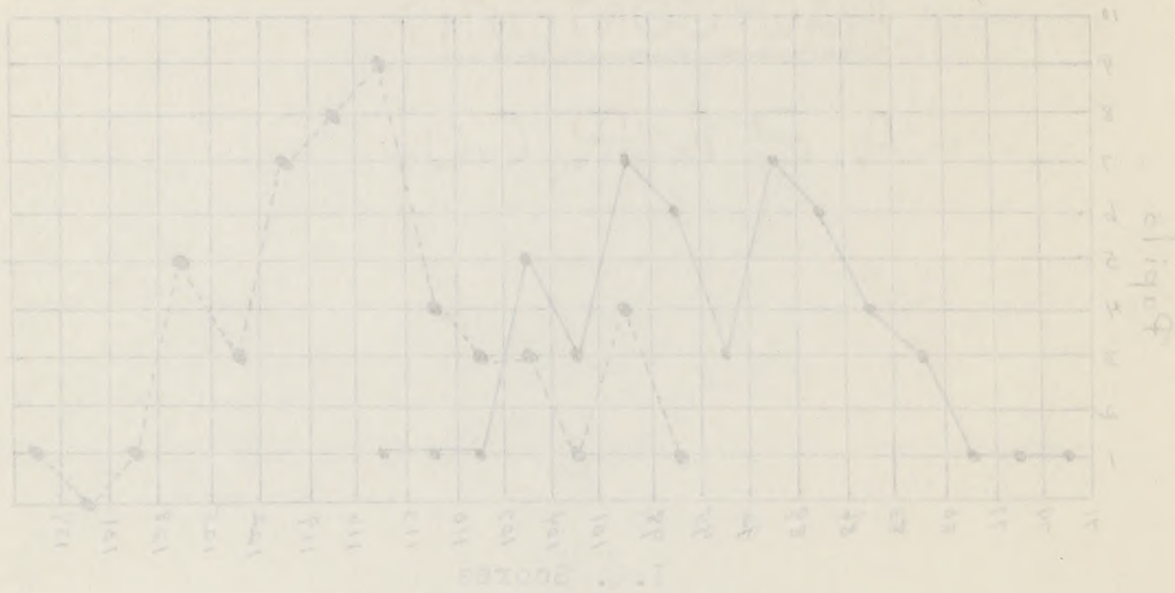
Higher 50 -------. Arithmetic Mean 115.24 S.D. 8.64

Test Scores

	Arithmetic Mean		Standard Deviation	
	Upper	Lower	Upper	Lower
Test I	95.58	78.24	3.08	14.64
Test II	96.2	51.36	5.35	16.55
Test III	88.94	60.54	5.33	11.76
Test IV	92.3	35.92	6.53	15.27

TABLE II

Relationship of I. Q. to Test Scores



Lower 50 _____. Arithmetic Mean 93.72 S.D. 7.29

Higher 50 -------. Arithmetic Mean 115.24 S.D. 4.54

Test Scores

	Arithmetic Mean		Standard Deviation	
	Upper	Lower	Upper	Lower
Test I	95.84	78.24	3.08	14.64
Test II	96.2	81.56	5.36	16.55
Test III	98.34	60.54	5.32	11.76
Test IV	92.5	75.92	6.53	16.27

IV

SUMMARY AND CONCLUSIONS

The purpose of this study was the construction of a mathematics test related to the New Bedford Course of Study that would satisfactorily measure achievement in the teaching of seventh grade mathematics.

The data obtained from this testing were analyzed statistically and the following conclusions were derived from the information obtained:

1. The complete test contained 149 items and only 41 or 27.5% of these failed to show a significant difference.

2. Part I, Part II and Part III in Test I, had many items not showing a significant difference because they were needed skills that all had learned, but were included for diagnostic information.

3. Part III in Test I was too simple for both good and poor students and needs reconstruction.

4. Certain sections of Test I and Test III offered but little challenge even to pupils having low I. Q.

5. The test was not of sufficient difficulty for the pupils of high mentality as determined by item analysis.

6. Item 10, in Part III of Test I was poorly placed on test page and, therefore, was omitted by many pupils.

7. Students having superior mentality did well on the problem solving tests.

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The data obtained from this testing were analyzed statistically and the following conclusions were derived from the information obtained:

1. The complete test contained 145 items and only 41 or 27.5% of these failed to show a significant difference.

2. Part I, Part II and Part III in Test I, had many items not showing a significant difference because they were needed while that all had learned, but were included for diagnostic information.

3. Part III in Test I was too simple for both good and poor students and needs reconstruction.

4. Certain sections of Test I and Test III offered but little challenge even to pupils having low I. Q.

5. The test was not of sufficient difficulty for the pupils of high mentality as determined by item analysis.

6. Item 10, in Part III of Test I was poorly placed on test page and, therefore, was omitted by many pupils.

7. Students having superior mentality did well on the problem solving tests.

8. In Test I, Part 6, both items 3 and 5 relating to Objective #5 need rewriting as they were too easily done by both good and poor achievers and as a result did not prove valid items. Finding 12½% of $250.75 and finding 5½% of $75.25 correct to the nearest cent would probably strengthen the value of these items considerably.

9. Example 1 in Part 7 of this same Test would become a valid item if it were composed of somewhat larger numbers. 96 is what % of 240? is suggested. This meets Objective #8.

10. One item such as item 6 in Test II, which covers Objective #10, needs reconstruction by either changing to a more difficult per cent, or to a larger amount of money on which to figure the commission. A commission rate of 12% would improve this item.

11. In Test III, which covers general information, item 2 in Part 1, needs more emphasis placed on its teaching. It is a vocabulary word in Objective #1.

12. Items 6 and 7 in this same Test III, relating to formulas and covering Objective #16, need rewriting as they offered no challenge at all to pupils of high achievement.

13. Item 11, a test on vocabulary in this Test III, Part I, should be eliminated and a more difficult item substituted.

14. Item 12, covering Objective #19 needs more study as the analysis shows that both groups failed to do well on its solution.

15. Test III, Part II, item 2, reveals a weakness in knowledge relating to area, and so Objective #17 needs more stress placed on it. Item 14 should be rewritten, as the poor group did much better on this item than the upper group. It pertains to the same Objective. Item 22 proves that a clearer understanding of formulas is necessary.

16. Item 4 in Test III, Part III should be rewritten as both groups failed to know this vocabulary word.

V

LIMITATIONS

This study has definite limitations because it was administered to only two hundred fifty students in one school, and this situation narrows considerably the opportunity for better comparison. The reliability of this instrument could have been increased had the tests been given to all the seventh grades throughout the city and under the supervision of just one teacher. The results thus obtained would have more accurately identified the items on which seventh grade students in general, need more teaching emphasis, and those items that are readily mastered.

In building this instrument, allowance was made for the differences in mentality by using only the minimum requirements of the Course of Study. Many of the examples consisted of simple numbers, with this same idea of caring for the pupil of low achievement. Therefore, as a result the pupils of superior ability were not provided with enough problems of a challenging nature.

RECOMMENDATIONS FOR FURTHER RESEARCH

1.The validated items could be used to construct an improved test along with the development and validation of more items to give the test a higher validity.

2. The revision, on the basis of statistical data, of all items revealing low validity, would greatly improve the quality

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In building this instrument, allowance was made for the differences in mentality by using only the minimum requirements of the Course of Study. Many of the examples consisted of simple numbers, with this same idea of setting for the pupil of low achievement. Therefore, as a result the pupils of superior ability were not provided with enough problems of a challenging nature.

RECOMMENDATIONS FOR FURTHER RESEARCH

1. The validated items could be used to construct an improved test along with the development and validation of more items to give the test a higher validity.

2. The revision, on the basis of statistical data, of all items revealing low validity, would see it improve the quality

and value of the test.

3. The substitution of examples based on the maximum requirements of the Course of Study, for all items that proved to have a low Critical Ratio due to the ease of solving, would definitely increase the validity of the test.

4. The test could be given to all seventh grade students in the city.

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APPENDIX

COURSE OF STUDY IN MATHEMATICS

SEVENTH GRADE

The fundamentals should be given in test form at least once a week with practice work between tests. See Improvement Tests and Practice Tests in Strayer-Upton.

MINIMUM	MAXIMUM
I. Fundamentals Integer, common and decimal fractions a. Checks Addition-add opposite way. Subtraction-add subtrahend to remainder. (3 wk.) Multiplication-by division. Division-by multiplication. b. Short cuts Multiplication by 10, 100, 1000 Division by 10, 100, 1000	Have pupils keep tests in a folder. Provide squared paper and a model of a line graph. Let those who wish keep a record on a graph.
II. Percentage Note: EMPHASIZE PER CENT OF means HUNDREDTHS TIMES. e.g. 39% means .39 times	
a. Meaning of per cent. b. Expressing per cent as hundredths and vice versa. (1 wk.) c. Finding per cents of numbers by multiplication by decimal form.	Optional now-Required under Topic 7 $22\frac{1}{2}\% = .22\frac{1}{2}$ $3\frac{1}{2}\% = .03\frac{1}{2}$ $1\frac{1}{4}\% = .01\frac{1}{4}$ $4\frac{3}{4}\% = .04\frac{3}{4}$
d. Application of percentage to problem solving 1. Commission 2. Single discount 3. Gain or Loss Note: Keep these solutions in decimal form. In U.S. Money teach computation to nearest cent.	

COURSE OF STUDY IN MATHEMATICS

SEVENTH GRADE

The fundamentals should be given in test form at least once a week with practice work between tests. See Improvement Tests and Practice Tests in Stryker-Upton.

TESTING	GAINING
I. Fundamentals Integer, common and decimal fractions a. Checks Addition-and opposite way. Subtraction-add subtrahend to remainder. Multiplication-by division. Division-by multiplication. b. Short cuts Multiplication by 10, 100, 1000 Division by 10, 100, 1000	Have pupils keep tests in a folder Provide squared paper and a model of a line graph. Let those who gain keep a record on a graph.
II. Percentage Test: TRANSLATE PER CENT OF MEANS MULTIPLYING BY .01. e.g. 25% means .25 times	
a. Reading of per cent. b. Expressing per cent as (1 wk.) hundredths and vice versa. c. Finding per cents of numbers by multiplication by decimal form.	Optional now-required under Topic 7 25% = .25 5% = .05 1% = .01 4% = .04
1. Application of percentage to problem solving 1. Commission 2. Simple discount 3. Gain or loss Note: Keep these solutions in decimal form. To 4.5. Money trash computation to nearest cent.	

25% -$\frac{1}{4}$	20% -1/5	$12\frac{1}{2}$% -1/8	33 1/3% -1/3	8 1/3% -1/12
50% -$\frac{1}{2}$	40% -2/5	$37\frac{1}{2}$% -3/8	66 2/3% -2/3	6 $\frac{1}{4}$ % -1/16
75% -$\frac{3}{4}$	60% -3/5	$62\frac{1}{2}$% -5/8	16 2/3% -1/6	10% -1/10
100% -1	80% -4/5	$87\frac{1}{2}$% -7/8	83 1/3% -5/6	30% -3/10

e. Short cuts in percentage. Memorize above equivalents. (2 wk.) Apply to problems as in "d" Much oral work.	Proving that these equivalents are true as given in the list.
f. Finding what per cent one number is of another. e.g. 15 is what per cent of 25? (2 wk.) $\frac{15}{25} = \frac{3}{5} = 60\%$ (This type of problem to be done by inspection.) e.g. $\frac{\$19.60}{\$\ 245}$) 19.60 Divide immediately unless fraction can be reduced to lowest terms by inspection.	In problems of gain and loss, there is an opportunity to introduce idea of amount and difference. Ideal for oral work.
III. MEASUREMENT. a. Review tables of length and surface. b. Rectangle - formulae Perimeter: $p = 2(b + h)$ (3 wk.) Area: $A = bh$ c. Practical problems	Construction. Use English and metric units. a. Erect perpendiculars. b. Bisect lines. c. Construct a square. d. Construct a rectangle.
IV. Graphs. Line and Bar. a. Interpreting graphs. b. If graphs must be made, provide squared paper. (2 wk.)	Preparing graphs. a. From school records b. From statistics.
V. DENOMINATE NUMBERS. a. Common tables of measures. b. Reduction ascending and (2 wk.) descending. The common units of measure may be reviewed with oral work in percentage.	Simple adding and subtracting of compound numbers.

25%	-1/4	20%	-1/8	12½%	-1/8	33 1/3%	-1/3	8 1/3%	-1/12
50%	-1/2	40%	-2/5	37½%	-3/8	66 2/3%	-2/3	6 2/3%	-1/15
75%	-1/4	60%	-3/5	62½%	-5/8	16 2/3%	-1/6	10%	-1/10
100%	-1	80%	-4/5	87½%	-7/8	83 1/3%	-5/6	50%	-3/10

e.	Short cuts in percentage. Memorize above equivalents. Apply to problems as in "d" Much oral work.	Proving that these equivalents are true as given in the list.
f. (2 wk.)	Finding what per cent one number is of another. e.g. 15 is what per cent of 25? $\frac{15}{25} = \frac{3}{5} = 60\%$ (This type of problem to be done by inspection.) e.g. $\frac{\$19.60}{\$24\%}$) 19.60 Divide immediately unless fraction can be reduced to lowest terms by inspection.	In problems of gain and loss, there is an opportunity to introduce idea of amount and difference. Ideal for oral work.
III. (3 wk.)	MEASUREMENT. a. Review tables of length and surface. b. Rectangle - formulae Perimeter: p = 2 (b + h) Area: A = bh c. Practical problems	Construction. Use English and metric units. a. Erect perpendicular. b. Bisect lines. c. Construct a square. d. Construct a rectangle.
IV. (2 wk.)	Graphs. Line and Bar. a. Interpreting graphs. b. If graphs must be made, provide squared paper.	Preparing graphs. a. From school records b. From statistics.
V. (2 wk.)	DENOMINATE NUMBERS. a. Common tables of measures b. Reduction ascending and descending. The common units of measure may be reviewed with oral work in percentage.	Simple adding and subtracting of compound numbers.

e.g. 25% of a peck is how many quarts? 33 1/3% of a foot is how many inches?	
VI. GAS AND ELECTRIC METERS. Reading meters. (For informational value only.) (1 wk.)	Computing cost of gas and electricity using rates in New Bedford.

VOCABULARY

This list contains terms already familiar for review, with additional new terms to be introduced as the subject is taught. In oral and written analysis of problems the right term is invaluable. Accurate thinking can be accomplished only with an adequate vocabulary.

sum	digits	marked price	vertical
difference	graph	discount	perpendicular
minuend	estimate	rate of discount	intersecting
subtrahend	annex	selling price	parallel
remainder	average	amount of sales	meter
multiplicand	numerator	commission	denominate number
multiplier	denominator	net proceeds	reduction
product	approximate	profit	factor
dividend	per cent	loss	cancellation
divisor	equivalents	scale	height) same
quotient	decimal	horizontal	altitude) meaning

MINIMUM	MAXIMUM
VII. PERCENTAGE. a. Constant review of all equivalents in oral work. b. Finding percentages of numbers (1 wk.) using per cents over 100% (1 wk.) Successive discounts. d. Interest i = prt (any rate) (3 wk.) Note: Multiplying by .06 or $\frac{6}{100}$ should be recognized as identical. e. Finding rate per cent. Continuing drill.	finding rates over 100% 60-day method Rate 6%

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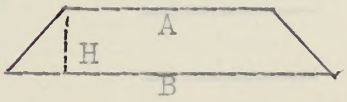
product	approximate	profit	factor
dividend	per cent	loss	cancellation
divisor	equivalents	scale	height } same
quotient	decimal	horizontal	altitude } meaning

MINIMUM	MAXIMUM
VII. PERCENTAGE. a. Constant review of all equivalents in oral work. b. Finding percentages of numbers using per cents over 100 (1 wk.) Successive discounts. (1 wk.) Interest i = prt (any rate) (3 wk.) Note: Multiplying by .06 or $\frac{6}{100}$ should be recognized as identical. e. Finding rate per cent. Continuing drill.	finding rates over 100% 60-day method Rate 5%

VIII. INTUITIVE GEOMETRY. Note: (a to e) (This type of work is important because of its explorative value; no intensive drill is necessary.) a. Teach use of protractor. b. Angles. Construct c. Triangles (4 wk.) Equilateral Isosceles Right d. Circle e. Measurement (1 wk.) (1. Review rectangle $p = 2(b + h)$ (2. Parallelogram $A = bh$ (3. Triangle $A = 1/2\ bh$ (2 wk.) 4. Circle $C = 2\pi r$ $A = \pi r^2$ (1 wk.) 5. Rectangular solid $V = lwh$ 6. Problems involving the above.	Bisecting angles Drawing to a scale Drawing figures in circles. $A = \frac{h(a + b)}{2}$ 
IX. GRAPHS Interpretation of circle (1 wk.) graphs	Construction of circle graphs.

VOCABULARY

successive	angle	parallelogram	degree
trade discount	semi-circle	trapezoid	dimensions
list price	arc	radius	base
net price	formula	diameter	height
principal	right angle	circumference	obtuse
rate of interest	equilateral triangle	rectangular solid	acute
protractor	isosceles triangle	pair of compasses	unit
square inch	cubic inch	capacity	volume

VIII. INTUITIVE GEOMETRY. Note: (a to e) This type of work is important because of its explorative value; no intensive drill is necessary.) a. Teach use of protractor. b. Angles. Construct c. Triangles Equilateral (4 wk.) Isosceles Right d. Circle e. Measurement f. Review rectangle (1 wk.) P = (b + h) 2. Parallelogram. A = bh 3. Triangle. A=1/2 bh (2 wk.) 4. Circle C= 2πr A= πr² (1 wk.) 5. Rectangular solid V=lwh 6. Problems involving the above.	Bisecting angles. Drawing to a scale Drawing figures in circles. A = h (a + b)
IX. GRAPHS Interpretation of circle (1 wk.) graphs	Construction of circle graphs.

VOCABULARY

successive	angle	parallelogram	degree
trade discount	semi-circle	trapezoid	alternate
list price	arc	radius	base
net price	formula	diameter	height
periodical	right angle	circumference	volume
rate of interest	equilateral triangle	rectangular solid	acute
protractor	isosceles triangle	pair of compass	unit
square inch	cubic inch	capacity	volume

ACHIEVEMENT TEST--I

Percentage

DIRECTIONS: Do your work right on this page. Follow the directions carefully. Do not stay too long on any one example, but try to get as many right as you can.

---

1. Change these per cents to decimals and then to their fractional equivalents in lowest terms:

a)	Per cents	Decimals	Fractions
1.	10%	_____	_____
2.	5%	_____	_____
3.	75%	_____	_____
4.	50%	_____	_____
5.	66 2/3%	_____	_____
6.	65%	_____	_____
7.	4%	_____	_____
8.	$37\frac{1}{2}$%	_____	_____
9.	72%	_____	_____
10.	$87\frac{1}{2}$%	_____	_____

2. Change these fractions to decimals and then to per cents:

	Fractions	Decimals	Per cents
1.	1/3	_____	_____
2.	4/5	_____	_____
3.	1/12	_____	_____
4.	8/25	_____	_____
5.	1/16	_____	_____

ADDITIVE TEST--1

Percentage

DIRECTIONS: Do your work right on this page. Follow the directions carefully. Do not delay too long on any one example, but try to get as many right as you can.

---

1. Change these per cents to decimals and then to their fractional equivalents in lowest terms:

a) Per cents	Decimals	Fractions
1. 10%	_____	_____
2. 5%	_____	_____
3. 75%	_____	_____
4. 50%	_____	_____
5. 25 1/2%	_____	_____
6. 5%	_____	_____
7. 4%	_____	_____
8. 37½%	_____	_____
9. 75%	_____	_____
10. 87½%	_____	_____

2. Change these fractions to decimals and then to per cents:

Fractions	Decimals	Per cents
1. 1/2	_____	_____
2. 4/5	_____	_____
3. 1/10	_____	_____
4. 4/25	_____	_____
5. 1/20	_____	_____

ACHIEVEMENT TEST--I

Percentage

3. Change these decimals to per cents:

a) .6 =
b) .45 =
c) 1.5 =
d) 1.25 =
e) .0625 =
f) .905 =
g) .1 =
h) 1.04 =
i) .005 =
j) 2.4 =

4. Change the following to <u>decimals</u> or <u>whole numbers</u> or <u>mixed numbers</u>:

a) 150% =
b) 200% =
c) .086% =
d) $112\frac{1}{2}$% =
e) 2.4% =
f) .40% =
g) $10\frac{1}{2}$% =
h) 2.1% =
i) 400% =
j) 375% =

5. Change the numbers below to <u>per cents</u>:

a) $1\frac{1}{4}$ =
b) $1\frac{1}{2}$ =
c) 1 3/8 =
d) 1 3/10 =
e) $\frac{1}{50}$ =
f) 1 7/8 =
g) $\frac{1}{9}$ =
h) 1 5/6 =
i) $\frac{1}{7}$ =
j) 2 1/8 =

ACHIEVEMENT TEST--I

Percentages

3. Change these decimals to per cents:

a) .8 = b) .48 = c) 1.5 =

d) 1.25 = e) .0625 = f) .005 =

g) .1 = h) 1.04 = i) .000 =

j) 2.4 =

4. Change the following to decimals or whole numbers or mixed numbers:

a) 150% = f) .40% =

b) 200% = g) 10½% =

c) .08% = h) 2.1% =

d) 112½% = i) 400% =

e) 2.4% = j) 275% =

5. Change the numbers below to per cents:

a) 1¼ = f) 1 7/8 =

b) 1/2 = g) 1/4 =

c) 1 3/8 =

d) 1 3/10 = h) 1 5/6 =

e) 1/25 = i) 1/4 =

j) 3 1/4 =

ACHIEVEMENT TEST--I

Percentage

6. Find the following per cents of these amounts:

a) 6% of $720	b) 55% of $9.50	c) $12\frac{1}{2}$% of $250 correct to the nearest cent.
d) 150% of $90	e) $5\frac{1}{2}$% of $75 correct to nearest cent	
f) Change these per cents to <u>fractions</u> and use to obtain answer.		
1) 25% of 12	2) 90% of 70	3) $62\frac{1}{2}$% of 32
4) 50% of 136	5) 33 1/3% of 1800	

ADJUSTMENT TEST--I

Percentage

1. Find the following per cents of these amounts:

a) 5% of $720	b) 35% of $4.60	c) 1½% of $800 correct to the nearest cent.
d) 11½% of $90	e) 5¾% of $70 correct to nearest cent	

2) Express these per cents to fractions and use to obtain answer.

1) 25% of 12	4) 30% of 70	3) 66⅔% of 42
4) 20% of 125	5) 33⅓% of 1,200	

ACHIEVEMENT TEST--I

Percentage

7.

a) 16 is what % of 24?	b) 36 is what % of 30?
c) _____% of 400 is 165?	d) Find what per cent the 1st number is of the second: 51 85
e) How much is $500 increased by 20% of itself?	f) Find % of decrease that the 2nd number shows over the first number: 72 45
g) What is interest on $580 for $2\frac{1}{2}$ years at 5% ?	h) Find interest on $250 for 180 days at 6%.
i) Find exact interest on $525 for 73 days at 6%.	j) What is the rate of interest, if $60 is paid for the use of $600 for 2 years?

ACHIEVEMENT TEST--II

Percentage Problems

1. Frank solved 85% of 20 problems correctly. How many problems did he solve correctly?

2. In a test, Fred spelled correctly 18 words out of 24. What per cent of the words did he spell correctly?

3. Twenty-seven inches is what per cent of one yard?

4. If a man earns $300 a month and saves 12½% of it, how much does he save in a year?

5. What will an overcoat cost if the marked price was $65 and it is now to be sold at a discount of 15%?

6. A salesman whose commission was 20% of his sales, sold a vacumn cleaner for $62.50. How much commission did he earn?

7. If a man's monthly salary decreases from $175 to $140, find the per cent of decrease.

8. Mr. Thompson bought an old boat for $35. He paid $8 to have it painted and $17 for repairs. What was his per cent of profit or loss if he sold the boat for $72 ?

9. Find the net price of a gas stove marked $230 less successive discounts of 10% and 5%.

10. If the principal was $750 and the interest paid at the end of a year was $45, what rate of interest was charged ?

11. Find the net proceeds on goods selling for $5000, if a commission of 10% was allowed.

12. The selling price of skates originally marked $10.00 was reduced to $8.00. What was the rate of discount ?

ACHIEVEMENT TEST--II

Percentage Problems

1. Frank solved 85% of 20 problems correctly. How many problems did he solve correctly?

2. In a test, Fred spelled correctly 18 words out of 24. What per cent of the words did he spell correctly?

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7. If a man's monthly salary decreases from $175 to $140, find the per cent of decrease.

8. Mr. Thompson bought an old boat for $35. He paid $8 to have it painted and $17 for repairs. What was his per cent of profit or loss if he sold the boat for $72?

9. Find the net price of a gas stove marked $210 less successive discounts of 10% and 5%.

10. If the principal was $750 and the interest paid at the end of a year was $45, what rate of interest was charged?

11. Find the net proceeds on cocoa selling for $5000, if a commission of 10% was allowed.

12. The selling price of sweets originally marked $10.00 was reduced to $7.00. What was the rate of discount?

ACHIEVEMENT TEST--III

GENERAL INFORMATION--Measurement, Vocabulary, Formulas, Graphs.

DIRECTIONS: Read examples 1 to 10 carefully. Decide which answer given is the correct one, and then place a check ( ) mark carefully below it.

---

1. A rectangular field is 26 rods long and 18 rods wide.

How many rods of wire are needed to enclose it?

1) 468 2) 108 3) 668 4) 44 5) Correct answer not given

---

2. A denominate number is a number that:

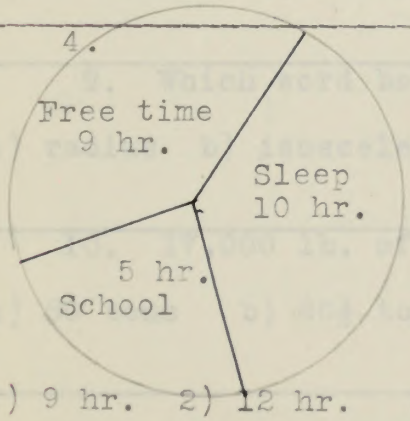
1) describes 2) denominates 3) tells 4) measures 5) deducts

3.

This garden measures 42 feet on each side. What is its correct area?

1) 84 sq. ft. 2) 924 ft. 3) 1764 sq. ft. 4) 84 ft. 5) 1744 sq. ft.

4.



The graph at the left shows the amount of sleep needed by a 12 yr. old boy. How many hours a day does he have for other things?

1) 9 hr. 2) 12 hr. 3) 5 hr. 4) 19 hr. 5) 14 hr.

ACHIEVEMENT TEST--III

GENERAL INFORMATION--Measurement, Vocabulary, Formulas, Uses.

DIRECTIONS: Read examples 1 to 10 carefully. Decide which answer gives the correct one, and then place a check ( ) mark carefully below it.

---

1. A rectangular field is 28 rods long and 12 rods wide. How many rods of wire are needed to enclose it?

1) 4ft. 2) 10ft. 3) 40ft. 4) 44. 5) Correct answer not given

---

2. A decimeter meter is a number that:

1) describes 2) denominates 3) tells 4) measures 5) defines

---

3. This garden measures 6 feet on each side. What is the correct area?

42 ft.

1) 24 sq. ft. 2) 24 ft. 3) 1764 sq. ft. 4) 36 ft. 5) 1044 sq. ft.

---

4. The graph at the left shows the amount of sleep needed by a 12 yr. old boy. How many hours a day does he have for other things?

1) 2 hr. 2) 12 hr. 3) 8 hr. 4) 10 hr. 5) 14 hr.

ACHIEVEMENT TEST--III

5. When we study the figures of a problem that we know how to solve, we can come close to getting the correct answer in our head. This is called _____ the answer.

1) guessing 2) solving 3) producing 4) estimating 5) finding

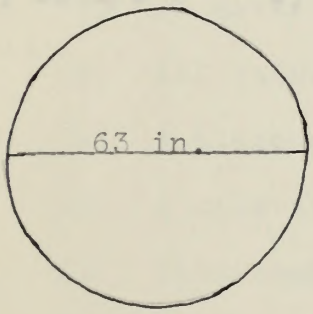
---

6. $P = 2(b + h)$ is a formula used in finding:

1) per cents 2) products 3) problems 4) proofs 5) perimeters

---

7. The circumference of this circle is:



a) 195 in. b) 198 in. c) 20 in. d) 108 in.

---

8. How many watts equal a kilowatt hour?

a) 110 watts b) 10 watts c) 180 watts d) 1000 watts

---

9. Which word below is the name of a kind of triangle?

a) radius b) isosceles c) octagon d) rectangle

---

10. 17,000 lb. of coal written as tons becomes:

a) 80 tons b) $80\frac{1}{2}$ tons c) $8\frac{1}{2}$ tons d) 85 tons

---

11. It travels in the same direction and is forever the same distance apart.

a) a vertical line b) a horizontal line c) a parallel line

ARITHMETIC TEST--III

4. When we study the figures of a problem that we know how to solve, we can come close to getting the correct answer in our head. This is called _____ the answer.

1) measuring 2) solving 3) reducing 4) estimating 5) finding

---

5. $I = E(R + r)$ is a formula used in finding:

1) per cents 2) products 3) problems 4) proofs 5) perimeters

---

7. The circumference of this circle is:

a) 18 in. b) 12 in. c) 36 in. d) 108 in.

---

8. How many watts equal a kilowatt hour?

a) 110 watts b) 10 watts c) 120 watts d) 1000 watts

---

9. Which word below is the name of a kind of triangle?

a) radius b) isosceles c) octagon d) rectangle

---

10. 17,000 lb. or most written as tons becomes:

a) 80 tons b) 8½ tons c) 8½ tons d) 85 tons

---

11. Literals in the same direction and in forever the same distance apart.

a) a vertical line b) a horizontal line c) a parallel line

12. The height of a parallelogram is always_____ to the base.

a) opposite b) the same as c) perpendicular d) parallel

---

13. If in drawing you used a scale of $\frac{1}{2}$ inch for 5 feet, how long a line would represent 45 feet?

a) $22\frac{1}{2}$ in. b) $2\frac{1}{2}$ in. c) 9 in. d) $4\frac{1}{2}$ in.

---

14. When $7.50 is divided by 9, the approximate number of cents is:

a) 83 1/3 ¢ b) 80 ¢ c) 83 ¢ d) 84 ¢

13. The height of a parallelogram is always_____ to the base.

a) opposite b) the same as c) perpendicular d) parallel

---

14. If in drawing you used a scale of ½ inch for 1 foot, how long a line would represent 4½ feet?

a) 2¼ in. b) 2½ in. c) 3 in. d) 4½ in.

---

15. When 87.50 is divided by 7, the approximate number of cents is:

a) 12½ ¢ b) 40 ¢ c) 75 ¢ d) 82 ¢

ACHIEVEMENT TEST--III

DIRECTIONS: Read each statement carefully. Place a + sign before it, if it is TRUE. Place a 0 before the statement if it is FALSE.

1. Twelve ounces equal $\frac{1}{2}$ lb.
2. A two-cent stamp has an area of about 1 square inch.
3. A bar graph and a line graph are the same.
4. The average of 21, 36, and 36, is 33.
5. To annex a zero means to add it to a number.
6. All rectangles are squares.
7. In division the answer is sometimes less than 1.
8. All squares are rectangles.
9. A discount is more than the regular price.
10. A mile is 5280 feet.
11. Nine inches is one third of a yard.
12. To triple a number means to double it.
13. The distance 18.375 ft. to the nearest tenth is 18.4 ft.
14. The perimeter of a rectangle 7 inches long and 5 inches wide is 24 square inches.
15. A square yard contains 9 square feet.
16. The diameter of any circle is half the size of the radius.
17. An acute angle is less than a right angle.
18. 250% of a number is the same as $2\frac{1}{2}$ times a number.

ACHIEVEMENT TEST--III

DIRECTIONS: Read each statement carefully. Place a + sign before it, if it is TRUE. Place a 0 before the statement if it is FALSE.

1. Twelve ounces equal ¼ lb.
2. A two-cent stamp has an area of about 1 square inch.
3. A bar graph and a line graph are the same.
4. The average of 21, 34, and 55, is 37.
5. To multiply a zero means to add it to a number.
6. All rectangles are squares.
7. In division the answer is sometimes less than 1.
8. All squares are rectangles.
9. A discount is more than the regular price.
10. A mile is 5280 feet.
11. Nine inches is one third of a yard.
12. To triple a number means to double it.
13. The distance 10.375 ft. to the nearest tenth is 10.4 ft.
14. The perimeter of a rectangle 7 inches long and 5 inches wide is 24 square inches.
15. A square yard contains 9 square feet.
16. The diameter of any circle is half the size of the radius.
17. An acute angle is less than a right angle.
18. 250% of a number is the same as 2½ times a number.

19. Either 3.1416 or 3 1/7 are used to find the distance around a rectangle.

20. A commission of 5% is the same as earning 5¢ on every dollar sale.

21. An obtuse angle would contain less than 90 degrees.

22. The formula for the area of a circle is πr^2.

23. Cancellation of a numerator and a denominator by the same factor is a form of division.

24. 15 hundredths is the same as 15%.

Boston University
School of Education
Library

ACHIEVEMENT TEST--III

DIRECTIONS: Place the figures found in the left-hand column against the word or words in the right-hand column, that best describe it.

1. altitude	( ) an instrument for measuring gas or electricity
2. isosceles	( ) price of goods in a catalogue
3. 90 degrees	( ) a part of a circle
4. reduction	( ) used in making circles
5. volume	( ) height
6. protractor	( ) crossing through
7. list price	( ) right angle
8. arc	( ) cubical contents
9. capacity	( ) discount
10. base	( ) a triangle
11. compasses	( ) the line on which a figure rests
12. meter	( ) $C = \pi D$
13. intersecting	
14. formula	
15. marked price	

APPLICATION TEST--III

DIRECTIONS: Place the figures found in the left-hand column against the word or words in the right-hand column that best describe it.

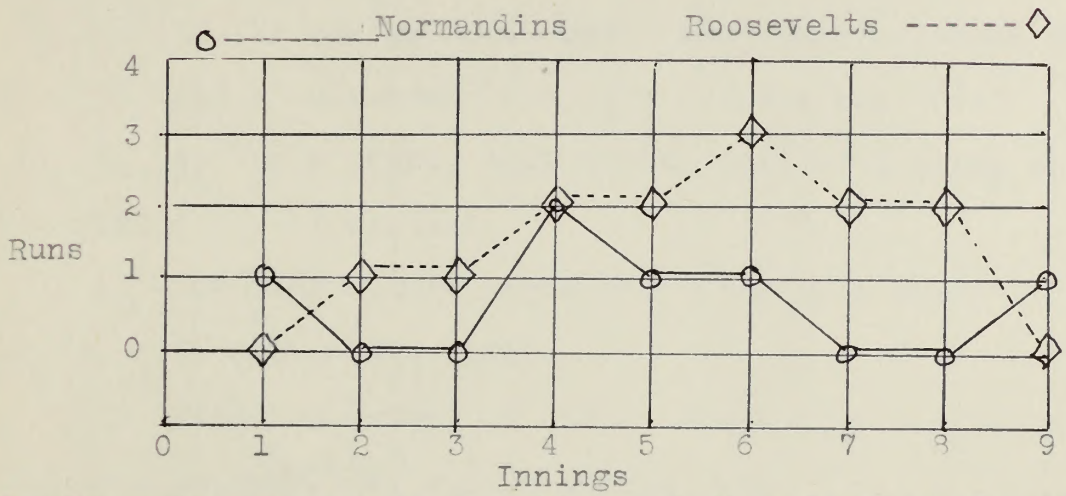
1. altitude	( ) an instrument for measuring gas or electricity
2. isosceles	( ) price of goods in a catalogue
3. 90 degrees	( ) a part of a circle
4. reduction	( ) need in making circles
5. volume	( ) height
6. protractor	( ) crossing through
7. list price	( ) right angle
8. arc	( ) cubical contents
9. capacity	( ) discount
10. base	( ) a triangle
11. compasses	( ) the line on which a figure rests
12. meter	( ) C = πD
13. intersecting	
14. formula	
15. marked price	

A Line Graph

Number of Runs Made by Roosevelts

and Normandins in Nine Innings of

Baseball



DIRECTIONS: Read each question and then look at the graph to find the correct answer. Write the correct answer on the blank after the question.

1) How many innings were played in the game? _____

2) How many runs did the Roosevelts make in the third inning? _____

3) How many runs did the Normandins make in the fifth inning? _____

4. How many times did the Roosevelts score one run? _____

5. How many more runs did the Roosevelts make than the Normandins in the 6th inning? _____

6. How many runs did the Roosevelts make in the whole game? _____

7. In what inning did both teams score the same number of runs? _____

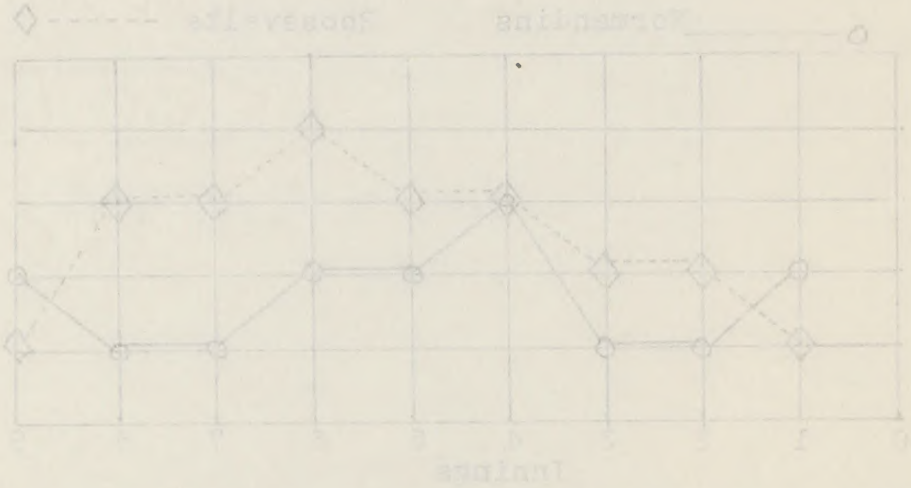
8. What was the number of runs made by the Normandins in the whole game? _____

A Line Graph

Number of Runs Made by Roosevelts

and Normandins in Nine Innings of

Baseball



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5. How many more runs did the Roosevelts make than the Normandins in the 5th inning? _____

6. How many runs did the Roosevelts make in the whole game? _____

7. In what inning did both teams score the same number of runs? _____

8. What was the number of runs made by the Normandins in the whole game? _____

9) Which team won the game? _____

10) Which team made no runs in four innings? _____

ACHIEVEMENT TEST--IV

Mensuration Problems

1. At $.35 per square foot how much will it cost to lay a concrete sidewalk 5 ft. wide, and 25 ft. long, in front of your house?

2. At the Boston track meet, one runner covered 26 miles in 2 hr. and 25 minutes. How many minutes was this?

3. At 75¢ a pound, what is the cost of a piece of bacon weighing 3 lb. 12 ounces?

4. How many square yards are there in a strip of carpet $1\frac{1}{2}$ ft. wide and 60 ft. long?

5. Find the number of cubic inches in a box 18 inches long, 15 inches wide, and $7\frac{1}{2}$ inches deep.

6. Change 1280 square rods to acres.

7. What is the area of a triangular flower bed having a base of 8 feet and an altitude of 6 feet?

8. Find the distance that a runner would travel around a circular race track that has a diameter of 105 rods.

9. Find the cost of running a 660-watt electric heater for 2 hours, at 6¢ per K.W.H.

10. At 95¢ per rod, what will it cost to fence your school yard, if the dimensions are 35 rods by 28 rods?

11. What is the area of a circular skating rink whose radius is 14 yards?

12. Mr. Ford sold a lot shaped like a parallelogram, at $.65 a square foot. If the base of the parallelogram was 90 ft. and the height 40 ft., how much did he receive for the lot?

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Mensuration Problems

1. At $.35 per square foot how much will it cost to lay a concrete sidewalk 5 ft. wide, and 25 ft. long, in front of your house?

2. At the Boston track meet, one runner covered 26 miles in 2 hr. and 25 minutes. How many minutes was this?

3. At 75¢ a pound, what is the cost of a piece of bacon weighing 1 lb. 12 ounces?

4. How many square yards are there in a strip of carpet 1½ ft. wide and 60 ft. long?

5. Find the number of cubic inches in a box 18 inches long, 15 inches wide, and 7½ inches deep.

6. Change 1280 square rods to acres.

7. What is the area of a triangular flower bed having a base of 8 feet and an altitude of 6 feet?

8. Find the distance that a runner would travel around a circular race track that has a diameter of 105 rods.

9. Find the cost of running a 650-watt electric heater for 2 hours, at 6¢ per K.W.H.

10. At 95¢ per rod, what will it cost to fence your school yard, if the dimensions are 35 rods by 25 rods?

11. What is the area of a circular skating rink whose radius is 14 yards?

12. Mr. Ford sold a lot shaped like a parallelogram, at $.65 a square foot. If the base of the parallelogram was 90 ft. and the height 40 ft., how much did he receive for the lot?

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